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B386 CENTRAL PROCESSOR UNIT (CPU) CARD

User Manual

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PREFACE

This manual outlines information required to operate the Model B386 CPU Cards from Texas Microsystems, Incorporated (TMI). The B386 is an IBM AT compatible central processor unit which may be used in conjunction with TMI's Series 2000, 3000, and 4000 computers, Series CC-xx Card Cages or with any IBM AT Bus slot compatible passive backplane. The instructions contained within this manual address operative aspects of the B386 which include installation, operation, diagnostics and maintenance. In addition, detailed information on standard and optional configurations is provided.

1.0 GENERAL DESCRIPTION

Texas Microsystems, Inc.'s Model B386 CPU card is functionally equivalent to the IBM AT computer. The B386 is designed to be inserted into a passive backplane configured in accordance with the popular IBM AT Bus standard. The B386 may be operated with all accessory cards that are AT compatible such as: serial and parallel I/O cards, video and disk controllers, etc. The B386 incorporates an eight layer PC board with internal ground plane which utilizes a 5 volt supply power source and dissipates only 10 Watts when configured with 8Mbytes of on-board RAM memory. Features of the B386 include the following:

* Complete computer on a plug-in card (AT bus connector)
* 80386 microprocessor with 16Mhz or 20Mhz (optional) clock.
* Parity checked RAM memory (1Mbyte to 16Mbyte - up to 8Mbytes on main board and 8Mbytes on half-length daughter board)
* Interleaved page-mode dynamic RAM provides effective zero wait state operation for most operations
* Programmable Array Logic (PAL)
* Clock/calendar with battery
* CMOS gate arrays
* Keyboard interface
* External speaker jack
* Low power dissipation (only 10 watts from a single 5 volt supply)
* Separate independent asynchronous software programmable bus controller assures compatibility with accessory cards.
* Basic Input Output System (BIOS) program stored in ROM
* 80387 math coprocessor socket
* Rear access Reset Switch
* "Setup" program stored in BIOS ROM
* Runs MS-DOS, PC-DOS, XENIX, CPM/86 Interactive Systems UNIX 386 and other popular "AT" and 80386 microprocessor compatible operating systems and application software

The B386 CPU Card contains the active electronic components historically found on computer active motherboards. This PC board contains an 80386 16Mhz 32-bit microprocessor, BIOS

stored in ROM, battery backed real time system clock, address-selectable parity checked system memory with DMA circuitry, sixteen programmable interrupts and 16-bit PC-AT bus interface electronics. Additionally, the B386 includes a speaker jack designed to accommodate a small 8 ohm speaker to provide error signals and keyboard entry tones. The speaker jack requires a 1/8" stereo three conductor Mini-Plug.

The B386 is implemented with CMOS and advanced low power shottky gate arrays for minimum power consumption and made up of six circuit layers, one power plane and one ground plane.

2.0 B386 HARDWARE

This section of the manual outlines information regarding hardware on the B386 CPU Card. Included in this section are Dip Switches, Jumper Blocks, Connectors, Memory Decoders, and Programmable BUS Through-put options which are user selectable.

2.1 B386 Dip Switches

The B386 contains one switch block (SW1) consisting of four open/closed switch tabs (designated SW1-1 through SW1-4) which control the default monitor type and the existence/use of the 80387 math coprocessor. See Figure 1 for location of SW1. Switch tabs SW1-2 and SW1-3 are not used at present and should remain in the factory default "OFF" position. The following outlines the switch tab settings options and the resultant function.

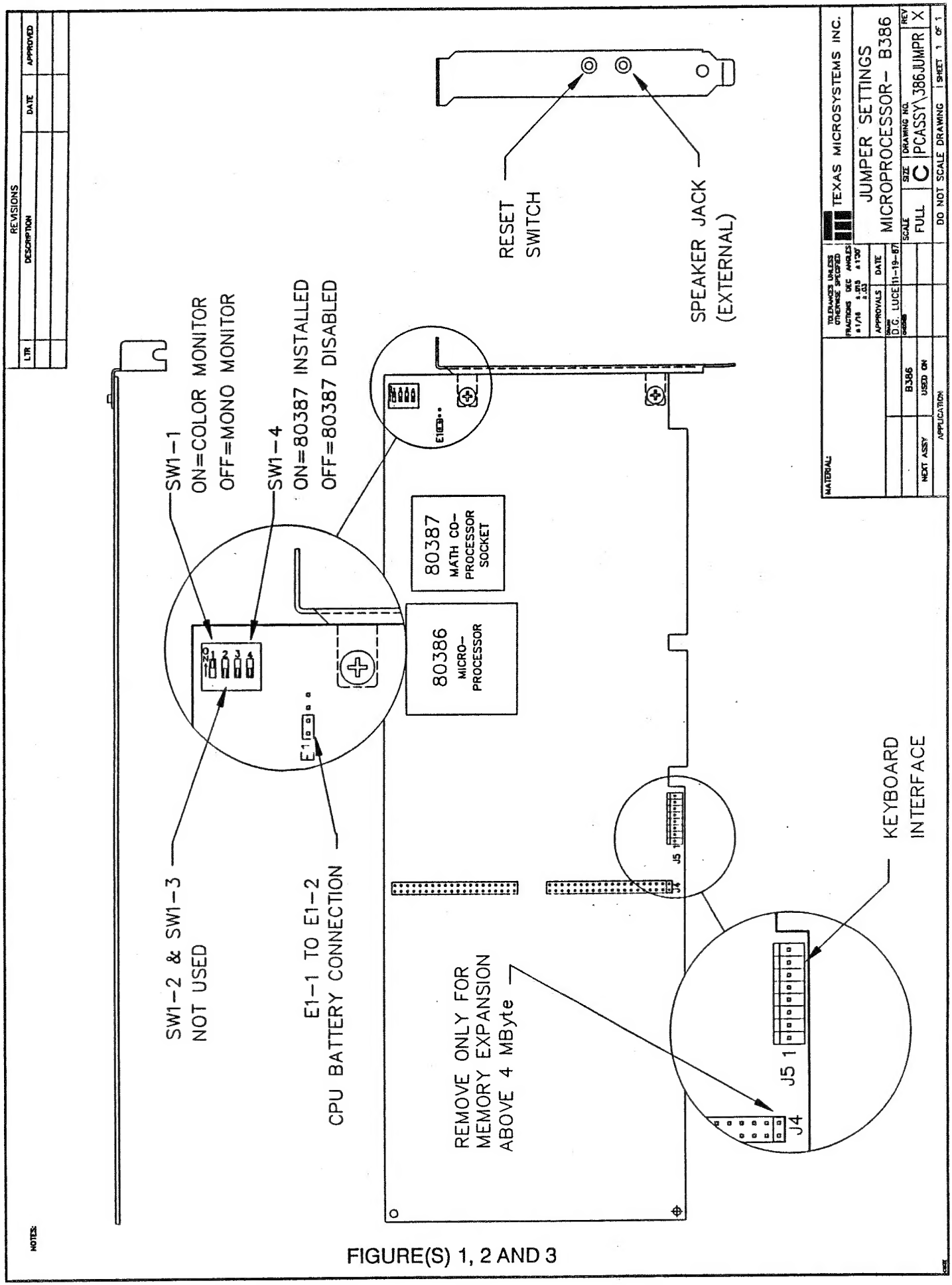
2.1.1 Monitor Setting (SW1-1)

Setting the default monitor type with SW1-1 configures the B386 to communicate correctly with the type of monitor installed and informs BIOS of the appropriate checks that it must make during power up diagnostics. The default factory setting of this switch tab is in the "ON" (color monitor) position.

SW1-1	DEFAULT MONITOR TYPE
ON	COLOR MONITOR
OFF	MONOCHROME MONITOR

2.1.2 80387 Settings (SW1-4)

Positioning SW1-4 determines the existence/use of the 80387 math coprocessor chip. The normal default setting of this switch is OFF when the B386 has been ordered from the factory without the 80387 math coprocessor installed. If the math coprocessor was ordered when the B386 was purchased and this chip was installed



FIGURE(S) 1, 2 AND 3

at the factory, switch SW1-4 will be preset at the factory for the use of this device with SW1-4 in the ON position.

SW-1 MATH COPROCESSOR USE	
OFF	80387 Not Installed
ON	80387 Installed

2.2 B386 Jumper Blocks

The B386 CPU contains one Jumper Block (E1 - see Figure 2 for location) which is jumper selectable by the user. This block pertains to the connection of the CPU lithium battery. The factory default setting of Jumper Block E1 is with a jumper installed between Pins 1 and 2.

B386 CPU BLOCK E1	
Option 1:	Jumper installed between Pins 1 and 2 (Battery Connected)
Option 2:	Jumper not installed (Battery Disconnected)
NOTE:	When Pins 1 and 2 are not installed, the system configuration which is stored in CMOS RAM is destroyed. Reconnection of the battery using a jumper between Pins 1 and 2 of E1 will require complete system reconfiguration using the Setup Utility.

2.3 B386 Keyboard Connector

The keyboard connector located on the B386 is an 8-pin header and

is located at position J5 (Figure 3). The pin-out of the connector is as shown below:

Pin 1	RESET SWITCH INPUT (N.O.)
PIN 2	GROUND
PIN 3	NOT CONNECTED
PIN 4	CLOCK
PIN 5	DATA
PIN 6	LOCK
PIN 7	+5V
PIN 8	AUDIO OUT

2.4 B386 Memory Decoding Devices

There are no jumpers or switches needed for B386 memory decoding. Decoding of the system memory on the B386 is handled automatically through the initialization software. However, it is necessary to configure the system memory correctly using the BIOS Setup Utility for proper operation (see Section 6.0 of this manual).

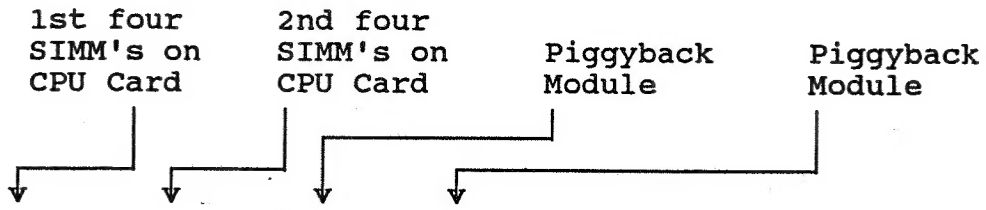
2.4.1 Memory Decoding Operation

During the Power-On Self-Test (POST), the B386 BIOS uses trial and error algorithms to automatically calculate the memory size, memory configuration and memory chip type.

Two memory part sizes for the CPU Card Main Board (256K SIMMs or 1MB SIMMs) are supported by the B386. These are installed in Banks 0 and 1. Additional memory on a Piggyback Board (1MB ZIP only) is supported for Banks 2 and 3. Addresses above the installed RAM are mapped to the AT compatible expansion bus.

As previously indicated, Banks 0 and 1 are physically located on the Main CPU Card. Banks 2 and 3 are located on a plug-in, Piggyback Card. Memory type population restraints allow that Banks 0 and 1 must be populated with the same RAM type (either 256K or 1MB). Banks 2 and 3 must be populated with 1MB chips only. Table 1 below summarizes the supported memory configurations:

Table 1



Bank 0	Bank 1	Bank 2	Bank 3	Total	Inter-leave	Organization*
256K				1MB	N	B0
1MB				4MB	N	B0
256K	256K			2MB	Y	B0, B1
1MB	1MB			8MB	Y	B0, B1
256K	256K	1MB	1MB	10MB	Y	B2, B3, B0, B1
1MB	1MB	1MB	1MB	16MB	Y	B0, B1, B2, B3

*NOTE:

The memory sizing algorithms of the BIOS dynamically configure any memory located in Banks 0 - 3 with contiguous addresses.

3.0 INSTALLATION

Prior to installation, the B386 should be physically configured for proper operation by setting the dip switch settings and/or jumper settings outlined in Section 2.0 of this manual.

To install the B386 into a TMI chassis or card cage after setting the jumpers and dip switches, locate the desired BUS location for the B386 board. Remove the I/O bracket spacer placed in the card slot and carefully push the card edge connector into the BUS slot. Attach the internal system keyboard connector cable to the B386 keyboard connector. Secure the card edge hold down bracket to the hold down lip using a Phillips head screwdriver. After installing the B386 and any other add-in cards desired, secure all the PC boards by appropriately positioning the card hold down bracket and securing it into place with the hardware provided for this purpose.

To install the B386 into a passive backplane not manufactured by Texas Microsystems, Inc., follow the above instructions, and the installation information provided by the backplane manufacturer.

4.0 STARTUP PROCEDURE

Information contained in this section pertains to start-up operations of the B386. Included is data outlining B386 powerup and BIOS routines which are performed during start-up operations.

4.1 Powerup

When power is applied to the B386, or whenever the unit is reset/restarted, approximately 64K of firmware (Phoenix tm BASIC INPUT OUTPUT SYSTEM (BIOS)) in one 64K x 8 EPROM on the B386 performs power-on checks of system configuration for initialization, operates computer diagnostics and invokes internal setup routines for configuration. As the power-on diagnostics occur, the B386 checks it hardware configuration and communicates with devices to ensure that no detectable errors exist. Following this verification, the B386 loads the operating system from a disk or other mass storage device. If the system parameters stored in battery backed CMOS are set properly, the BIOS copies itself into RAM and deactivates the EPROM. If enabled, the same is done for EGA ROM BIOS if one exists (refer to section 6.3 of this manual for details).

There are three methods for restarting the B386:

1) Cycle power ON and OFF.

2) Reboot the system (keyboard required). Using the keyboard, press and hold the CTRL and ALT keys and then press the DEL key.

3) Depress the B386 reset switch located on the exterior exposed edge of the card.

Note: Using any of the above methods to restart or reboot the B386 will result in system memory data loss. Therefore, it is suggested that where possible all processing be completed before reboot/reset.

Upon completion of the power-on diagnostics tests, the B386 loads the operating system from disk or other mass storage device. However, if CMOS RAM contents are not correct, the B386 will

prompt the user to invoke the Setup Utility (see Section 6.0 of this manual).

4.1.1 B386 BIOS

The BIOS is a collection of driver and initialization software stored in ROM on the B386 card. The BIOS is designed to be totally compatible with software written for the IBM PC AT. The I/O drivers are invoked through the software interrupt structure of the 80386 processor on the B386 CPU.

BIOS performs internal diagnostics to check the current physical configuration against the configuration information recorded in CMOS memory during Setup (see Section 6.0 of this manual regarding the BIOS Setup Utility). If inconsistencies exist, BIOS error messages are displayed.

Some errors determined by the BIOS to be significant in nature, will automatically abort start up and display an error message on the screen.

Some of the errors noted during power-up can be quickly corrected by checking the Setup information. More technical errors may require the assistance of trained B386 technical personnel. Some of the elements tested during BIOS diagnostics include the following:

* Microprocessor chip (80386)
* DMA controllers
* Real time clock chip
* Interrupt controller chip
* RAM memory
* BIOS ROM (check sum used for validity)
* Time-of-day clock (CMOS RAM)
* Floppy disk drive controllers
* Hard disk drive controllers
* Keyboard
* Video controllers

The Setup Utility which is used to pre-set system parameters for BIOS diagnostics checks can be accessed by pressing and holding

the CTRL and ALT keys on the keyboard at the same time while pressing the character S key on the keyboard.

CAUTION: DO NOT USE THE RESET SWITCH OR CTRL ALT DEL TO LEAVE THE SETUP UTILITY. ABANDONING THE SET-UP UTILITY IN THIS MANNER WILL RESULT IN CMOS CHECKSUM ERRORS DURING POWER-UP OR REBOOT. REFER TO SECTION 6.0 OF THIS MANUAL FOR DETAILS.

Although BIOS power-up diagnostics are not comprehensive, the few seconds that the BIOS routine requires are very effective in identifying problems. For in-depth diagnostics that are more comprehensive and require more time, the IBM Advanced Diagnostics program for the AT can be used.

4.1.1.1 BIOS Startup Routine

The BIOS is a collection of driver and initialization software stored in ROM on the B386 CPU Card. The BIOS is designed to be totally compatible with software written for the IBM personal computers. The I/O drivers are invoked through the software interrupt structure of the 80386 processor.

The largest portion of the BIOS software program (approximately 4Kbytes) is devoted to computer startup. During this procedure, the memory and I/O ports are tested and initialized. If everything goes well and no errors are detected, an operating system is loaded and executed from the disk or other mass storage device.

4.1.1.2 Loading Disk Operating system (DOS)

After the B386 BIOS has performed its diagnostics and verified the correct physical configuration and functionality of the equipment, BIOS then directs the media devices to look for and load the operating system.

The operating system may exist on and be loaded into the B386's memory from various storage media. BIOS searches for the loading system first on floppy disk Drive A and then on the drive which has been designated as Drive C. A drive designated other than A or C will not be searched for the operating system.

Notes:

1) In order to load the operating system from Drive C, a diskette must not be engaged in Drive A. If a diskette is placed and engaged in floppy disk Drive A, the BIOS will try to load the operating system from Drive A only. If the operating system files exist on the diskette in Drive A, the operating system is loaded. If, however, the operating system files do not exist on the diskette in Drive A, BIOS will issue an error message on the screen and will suspend the loading procedure. Therefore, Drive C, once the existence of media in Drive A has been detected, will not be read. This aspect of BIOS serves a specific function, especially in cases where the operating system and application programs are loaded automatically from Drive C without operator/user interface. In cases where it is desired to circumvent automatic loading and/or execution, this provides a method to return control of the system manually to the operator/user. An example of an instance when this might be desired would be when it is necessary to update/change program files. In this fashion, the operator would take control of the system during start-up, before a program automatically executes, and would be able to make the required updates/changes to the application program prior to execution. It is also important to note that placement/engagement of a diskette in Drive A after the operating system has been loaded will not signal an error message and will not affect operating system or application program functions.

2) The B386 CANNOT boot and the operating system WILL NOT be automatically loaded from Drive B.

Once the B386 BIOS has located the operating system on the storage media, two operating system hidden files and the operating system command file are loaded into resident memory. At this point the operating system has loaded.

5.0 GENERAL MAINTENANCE

The B386 is a ruggedized module which requires minimal maintenance. However, as with any complex electrical hardware, an adequate maintenance program will enhance its ability to provide trouble-free performance and will extend the B386's lifespan.

In general terms, maintenance includes periodic inspection of the B386 to ensure that it is clean and free from signs of wear and/or stress. If it requires cleaning, the B386 should be cleaned only by a TMI Service Representative.

WARNING: No moisture or condensation may come in contact with the B386 electrical components or cables/connectors. Damage to sensitive components may occur.

Inspect all cables and connectors to verify that they are securely fastened to their connecting component(s). Cables and connectors which appear to be stressed must be replaced.

All peripheral equipment for use with the B386 should be properly maintained in a similar manner. Malfunctioning equipment should be replaced expediently to prevent damage to the B386 CPU.

5.1 Battery Replacement

The B386 CPU Card contains a built-in high capacity lithium battery which supports the real time clock for retention of the correct time, date, and computer parameters in resident memory when the system in which the B386 is installed is powered OFF. This retained information assists BIOS in performing initialization and configuration during power-up or reset.

The CPU battery is designed to provide many years of service without replacement. However, if configuration or clock related inconsistencies occur and/or if the B386 has been in service for more than four (4) years, the battery may require replacement.

Replacement of the B386 battery requires that the old battery be disconnected and unsoldered. Then a new battery is soldered in place and reconnected to the B386. A battery replacement kit may be purchased from TMI or the B386 may be returned to the factory

for this service. Contact the nearest TMI Sales Representative for details.

6.0 SETUP UTILITY

The B386 Setup Utility is a special set of commands which reside in ROM and which is used to set the computer time, date and configuration data. Configuration information from the Setup Utility is stored in CMOS RAM. During power-up, BIOS verifies that the actual configuration of the system is consistent with the configuration information provided in the B386 Setup Utility. If inconsistencies are discovered, BIOS error messages are displayed on the video monitor.

The user is prompted to invoke the Setup Utility by pressing F2 during power-on if BIOS encounters errors when trying to use the setup information. Additionally, the Setup Utility can be accessed by pressing and holding the CTRL and ALT keys on the keyboard at the same time while pressing the character S key on the keyboard. This method of invoking the Setup Utility should be performed at the operating system command level (DOS prompt, i.e., A>, B>, C>, etc.). When accessed via an application program, the Setup Utility may/may not function properly. Due to the variety of results which could occur, this manual only documents and supports system access to the Setup Utility (where the operator is prompted to touch F2 for access) or operator manual access (CTRL, ALT, S) at the DOS command line level. These two methods of Setup Utility access will result in proper operation of this feature as outlined in this section of the manual.

Five screen pages make up the B386 Setup Utility. The first three pages deal with configuration selections most often selected by B386 users. The fourth page of the Setup Utility allows for setup of illegal conditions, for CMOS RAM Dump and system configuration and should only be altered by those who possess the technical expertise to interpret the values noted on these pages. Page 5 of the Setup Utility outlines helpful information such as BIOS creation date and information on setting the "Block Move" field on Page 1, and a cautionary message on the alteration of Page 4 of the Setup Utility. Additionally, when a user enters the Setup Utility or moves from one page to another of the Setup Utility, the cursor is located on a selectable field (usually the first selectable field of the page). The information contained in this section pertains to the Setup Utility pages, selectable fields and selections, and the special keys (ARROW UP, ARROW

DOWN, PLUS, MINUS, HOME, and END) used for configuring the system using the Setup Utility.

CAUTION: DO NOT USE THE RESET SWITCH OR CTRL-ALT-DEL TO LEAVE THE SETUP UTILITY. ABANDONING THE SETUP UTILITY IN THIS MANNER WILL RESULT IN CMOS CHECKSUM ERRORS DURING POWER-UP OR REBOOT. USE ONLY THE END KEY OR THE HOME KEY TO TO LEAVE THE SETUP UTILITY (Note: Exception to using the CTRL-ALT-DEL key when exiting the Setup Utility when desiring return to factory default settings - refer to Setup Utility Page 5 information).

6.1 Setup Utility Page 1

When the setup Utility is initially accessed, page 1 will be displayed on the video monitor as exampled in Figure 4.

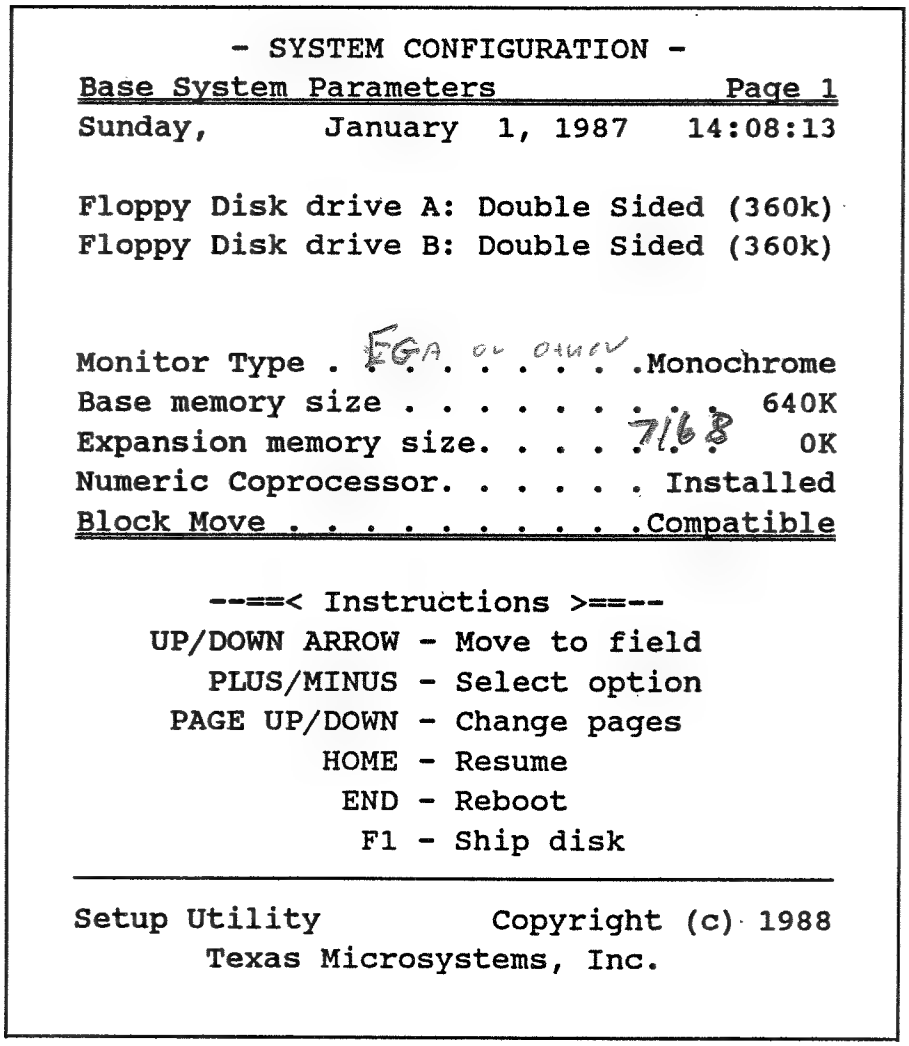


Figure 4 - Setup Utility Page 1

As noted in the Setup Utility Page 1 example, when the Setup Utility is accessed, the cursor is located on the "day" field. To change information in this field, touch the plus (+) or minus (-) keys near the numeric keypad area of the keyboard repeatedly until the desired selection is displayed. When the desired selection is displayed in the field, touch the up arrow key (8) or down arrow key (2) on the numeric keypad of the keyboard to move to the next (up arrow) or previous (down arrow) field.

In each field, the plus or minus keys will display additional selections for that field. Continue altering field selections and moving from field to field until all fields contain the desired selections. Then, to move to another page of the Setup

Utility, touch the PAGE UP key (9) on the numeric keypad to move to the next page of the Setup Utility or the PAGE DOWN key (3) on the numeric keypad to move to the previous page of the setup utility to continue the configuration selection process.

To exit the Setup Utility, depress the END (1) key or the HOME (7) key on the keyboard's numeric keypad. Using END will write the chosen Setup Utility configuration selections to CMOS RAM, restart the system, and will allow the system to be configured based upon those selections. Using HOME will write the configuration information to CMOS RAM but will do so without resetting the system and could result in operating inconsistencies. Refer to paragraphs 6.6 and 6.7 of this manual for a more thorough explanation of the use of the HOME and END keys of the Setup Utility.

The "Block Move" field on Page 1 of the Setup Utility allows the user to increase the speed of block move data transfers in and out of extended memory. Incompatibility problems with older software protection mechanisms, especially electronic keys, may occur. In these instances the Block Move field "Compatible" selection should be used.

Note: The "Compatible" mode will not hamper B386 performance but selectability of this field is provided as an added feature only.

6.2 Setup Utility Page 2

Page 2 of the Setup Utility appears on the video monitor as shown in Figure 5.

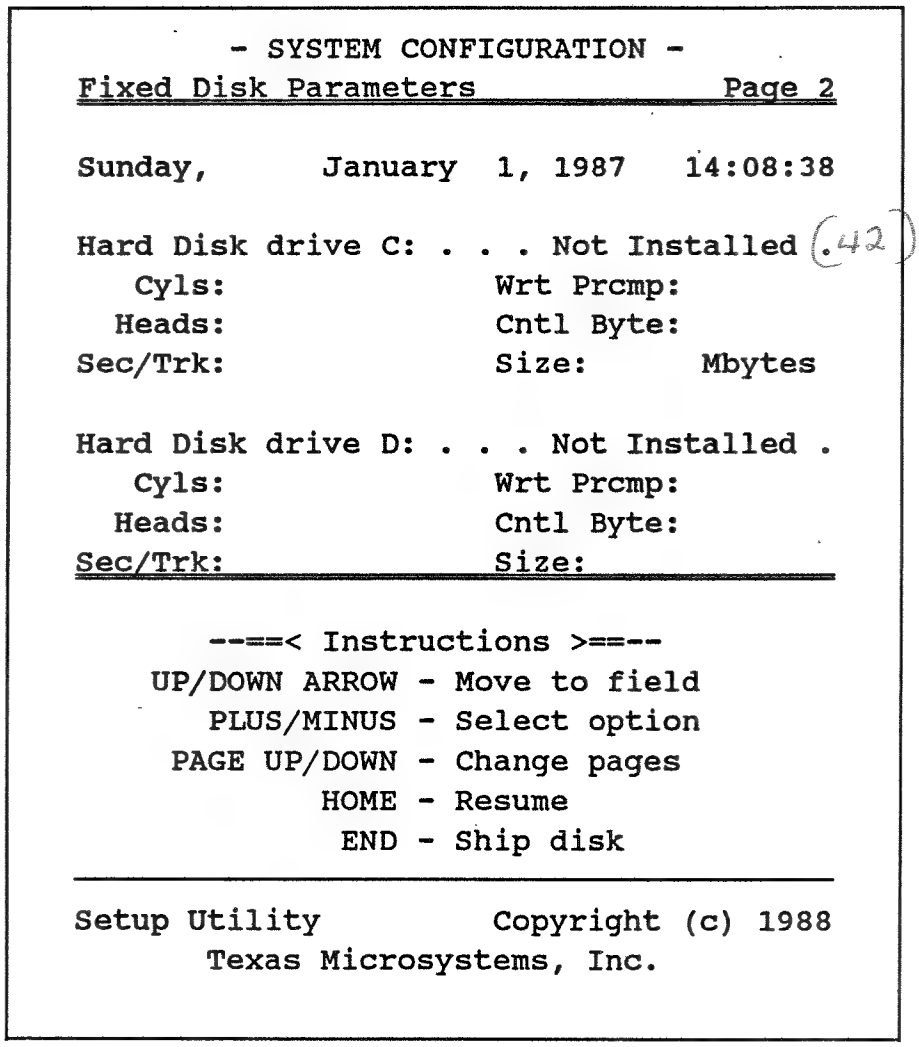


Figure 5 - Setup Utility Page 2

As noted by the example of Page 2 of the Setup Utility, the selections for this Setup Utility page address selectable fixed disk drive parameters for up to two fixed disk drives per system (Drive C and Drive D). Movement from field to field and from page to page of the Setup Utility is the same as that defined in the previous sub-section for Page 1 of the Setup Utility (see paragraph 6.1). Likewise, selections within a field are chosen using the plus (+) or minus (-) keys located near the numeric keypad on the keyboard.

The BIOS Setup Utility provides configuration compatibility for selection of 47 different drive types. When fixed disk drives

are purchased installed into a Texas Microsystems' Computer System with a B386 CPU Card, the drives are configured through the resident Setup Utility program at the TMI factory. In many instances, however, fixed disks are added to a TMI or other system at a later date by the user. The drive types (and Setup Utility selections) supported by the BIOS for use with the B386 CPU are outlined in TABLE 3. For information on drive types purchased from TMI, refer to the note below or contact the factory. For information on drive types procured elsewhere, contact the drive manufacturer or the sales representative from whom the drive was purchased.

NOTE: To verify the correct drive type for drives purchased from and/or installed by TMI, check the sales order form sent with the equipment. The drive type is specified on this form.

To exit the Setup Utility, refer to the instructions for the END key or the HOME key (paragraphs 6.6 and 6.7) in this manual.

TABLE 3

PHOENIX BIOS SUPPORTED FIXED DISK DRIVE CONFIGURATIONS

DRIVE TYPE	CYLINDERS	HEADS	SECTIONS/TRACKS	WRITE PRE-COMPENSATION	CONTROL BYTES
1	0306	04	17	00128	00
2	0615	04	17	00300	00
3	0615	06	17	00300	00
4	0940	08	17	00512	00
5	0940	06	17	00512	00
6	0615	04	17	NONE	00
7	0462	08	17	00256	00
8	0733	05	17	NONE	00
9	0900	15	17	NONE	08
10	0820	03	17	NONE	00
11	0855	05	17	NONE	00
12	0855	07	17	NONE	00
13	0306	08	17	00128	00
14	0733	07	17	NONE	00
15					
16	0612	04	17	00000	00
17	0977	05	17	00300	00
18	0977	07	17	NONE	00
19	1024	07	17	00512	00
20	0733	05	17	00300	00
21	0733	07	17	00300	00
22	0733	05	17	00300	00
23	0306	04	17	00000	00
24	0000	00	00	00000	00
25	0615	04	17	00000	00
26	1024	04	17	NONE	00
27	1024	05	17	NONE	00
28	1024	08	17	NONE	00
29	0512	08	17	00256	00
30	0615	02	17	00615	00
31	0000	00	00	00000	00
32	0000	00	00	00000	00
33	0000	00	00	00000	00
34	0000	00	00	00000	00
35	1024	09	17	01024	08
36	1024	05	17	00512	00
37	0830	10	17	NONE	08
38	0823	10	17	00256	08
39	0615	04	17	00128	00
40	0615	08	17	00128	00
41	0917	15	17	NONE	08
42	1023	15	17	NONE	08
43	0823	10	17	00512	08
44	0820	06	17	NONE	00
45	1024	08	17	NONE	00
46	0925	09	17	NONE	08
47	0699	07	17	00256	00

6.3 Setup Utility Page 3

The third page of the B386 Setup Utility allows for enabling/disabling of configuration errors, enabling/disabling shadow RAM downloading, and user selectable programming of wait states and delay cycles. Figure 6 outlines the appearance of the Setup Utility Page 3.

```
            - SYSTEM CONFIGURATION -
CPU Special Configuration Options Page 3

Sunday,      January  1, 1987   14:08:48

Configuration Errors:
   Keyboard . . . . . . . . . . Disabled
   Display. . . . . . . . . . . Disabled
   Floppy Disk Drives . . . . . Disabled
Shadow RAM:
   BIOS  . . Enabled
   Video . .Disabled   C4000 . . Disabled
   C8000 . .Disabled   CC000 . . Disabled
   D0000 . .Disabled   D4000 . . Disabled
   D8000 . .Disabled   DC000 . . Disabled
   E0000 . .Disabled   E4000 . . Disabled
   E8000 . .Disabled   EC000 . . Disabled
Clock Selections:
   BUS . . . .  6Mhz   DMA. . . . .  3Mhz
Cycles:   WS=Wait States,  DLY=Cmd Delay
    32 Bit WS. . 0   32 Bit PreChg  .3CYC
    16 Bit WS. . 1   16 Bit Mem DLY . . 0
     8 Bit WS. . 4    8 Bit Mem DLY . . 1
  8/16 Bit I/O DLY . . . . . . . . . . 1
```

Figure 6 - Setup Utility Page 3

6.3.1 The Configuration Errors fields allow the user to enable/disable the error generation function of the BIOS test during powerup/reboot/reset. The three fields determine the action of the BIOS during powerup/reset relating to the absence of certain peripheral devices. If any of the fields ("Keyboard", "Display", or "Floppy Disk Drives") is selected as "Disabled", no errors

will be generated nor will operator intervention be required if the appropriate device/controller is not attached. Setting these fields to "Enabled" will require the operator to acknowledge the device's absence by pressing the F1 key.

6.3.2 The Shadow RAM fields allow the user to control powerup down-loading of slow, 8-bit EPROMs containing BIOS software (on the system board or the channel adaptors) into fast, 32-bit memory on the B386. Selectable fields are as outlined below:

1) Setting the "BIOS" field to "Enabled" causes the B386 BIOS Code to be copied into write protected 32-bit memory during the powerup process. If the field is set to "Disabled", the BIOS will operate from 8-bit EPROM memory. The default for this field is "Enabled" and the BIOS is designed for operation from the faster memory. Setting this field to "Disabled" severely limits the performance of the system.

2) Setting the "Video" field to "Enabled" results in downloading of the video control BIOS (if it exists on a channel adaptor such as an EGA card) into 32-bit memory during powerup. If the field is set to "Disabled", the video BIOS will be executed from 8-bit EPROM on the I/O channel. A great improvement in performance can be realized by enabling this feature.

   Note: Some video adaptors have a BIOS code which exceeds the 16K length of the "Video" field. For these adaptors, operators should also set the C4000 field to "Enabled". Video BIOS which use paging techniques to compress 32K of code into a 16K space cannot be shadowed. Such adaptors will have 27513 EPROM devices or 27256 EPROM devices.

3) The remaining range of EPROM addresses, in 16K increments starting with C4000 and ending with EFFFF, may also be shadowed by choosing the

"Enabled" selection. These settings can be used to shadow devices such as "hard cards", RAM disk cards, etc. Refer to the documentation associated with these adaptors for the proper address ranges, etc.

6.3.3 The Clock Selections fields provide the user with the ability to set the I/O BUS speed and the speed of the onboard DMA controllers

The "BUS" field selects the clock speed of the onboard PC bus state machine. Possible values are "5.33Mhz", "6Mhz', and "8Mhz". For normal operation and compatibility, the "8Mhz" setting should be chosen. If the user suspects a hardware related problem with a channel adaptor, a slower clock can be selected. Note that some performance degradation will occur at the slower speeds.

The "DMA" field selects the clock speed of the onboard DMA controllers. The options are: 1) Set DMA to 1/2 of the system clock, or 2) Set DMA equal to the system clock. Option 1 is the default for normal operation and compatibility. In DMA intensive systems (imaging, hi-resolution graphics, etc.) where it is know that all DMA devices can accept the faster transfer cycle, option 2 may be chosen.

6.3.4 The Cycle Control fields allow the user to add/delete wait states or command delays (measured in cycles) as required to provide a higher degree of compatibility for use with older software and/or peripherals.

The "32 Bit WS" and "32 Bit PreChg" fields control the timing for onboard system RAM. For 100ns RAMs, the proper values are:

"32 Bit WS. . 0 32 Bit PreChg .3CYC."

For 120ns RAMs, the proper values are:

"32 Bit WS. . 1 32 Bit PreChg .5CYC."

The default for un-initialized CMOS is 1WS and 5CYC. For the

majority of systems (using 100ns RAMs), these values should be changed during CMOS initialization.

The remaining five fields control the number of wait states and command delays for the different types of BUS cycles. For these fields, "wait states" refers to extra cycles added to the state machine cycles. "Command delays" refers to the position of the leading edge of the read and write (e.g. IOW~) strobes in one half units of ATSCLK (usually 8Mhz) within the selected wait states. In other words, adding a command delay moves the leading edge of the command strobe out by 1/2 of ATSCLK but does not affect the length of the cycle. Table 4 outlines the relationships between the fields and their respective cycles.

Note: These fields outlined in Table 4 are pre-set at the factory for optimum performance and compatibility. The user should use extreme caution when changing these values. It may be possible to prevent the system from operating by choosing settings beyond the capabilities of display adaptors, etc. If this occurs, remove the battery jumper and wait for the CMOS memory to lose its contents (this may take more than an hour in some cases - be patient). The system will then operate with the factory defaults.

Field Name	Affects I/O Cycle	Affects Mem. Cycle	Extends Cycle	Moves Command Strobe	Default Value
16 Bit WS	16 Bit	16 Bit	Yes	No	1
8 Bit WS	8 Bit	8 Bit	Yes	No	4
16 Bit Mem. DLY	No	16 Bit	No	Yes	0
8 Bit Mem. DLY	No	8 Bit	No	Yes	1
8/16 Bit I/O DLY	All	No	No	Yes	1

Table 4 - Wait State/Command Delay Cycles

6.4 Setup Utility Page 4

As previously indicated in this manual, the fourth page of the Setup Utility allows for setup of illegal conditions for CMOS RAM Dump and system configuration and must only be altered by those who possess the technical expertise to interpret the values noted on this page. Additionally, persons making changes to the values on page 4 of the Setup Utility must be very knowledgeable

of computer parameters and the resultant changes to the values on this Setup Utility page.

Page 4 of the Setup Utility appears on the video monitor as shown in Figure 7.

```
          - SYSTEM CONFIGURATION -
CMOS RAM Dump                                   Page 4

Sunday,        January  1, 1987    14:09:01

     15 00 11 FF FF FF 02 11
00:  00 00 09 00  14 00 01 01  ........
08:  01 87 26 02  50 80 00 00  .&.P .
10:  11 00 00 00  73 80 02 00  .. .s..
18   00 10 00 00  00 00 00 00  ........
20:  00 00 00 00  00 00 00 00  ........
28:  00 00 00 00  00 00 01 16  ........
30:  00 00 19 90  00 00 00 47  ......G
38:  46 46 00 00  00 00 00 00  FF......
40:  11 01 00 00  00 00 00 00  ........
48:  00 00 00 00  00 00 00 00  ........
50:  62 25 00 00  00 00 00 00  ........
58:  00 00 00 00  00 00 00 00  b%......
60:  00 00 00 00  00 00 00 00  ........
68:  00 00 00 00  00 00 00 00  ........
70:  00 00 00 00  00 00 00 00  ........
78:  00 00 00 00  00 00 00 99  ........

    Seconds
    Address: 00H   Value:  00H
```

Figure 7 - Setup Utility Page 4

As indicated by the example of Page 4 of the Setup Utility, altering of the values in the fields on this page requires a high degree of computer literacy to interpret the values and to understand the results of changing these values. Therefore, it is highly recommended that page 4 not be altered from the default settings made at the factory (default factory settings are shown in the example of Page 4, Figure 7). If alteration of the values for this page are desired, contact a Texas Microsystems Customer Service Representative at the factory for details.

6.5 Setup Utility Page 5

Page 5 of the BIOS Setup Utility outlines the B386 ROM initialization date, current date and time information and informative data on the Block Move field of Page 1, and provides a cautionary message on the alteration of values to Pages 3 and 4 of the Setup Utility. Additionally, Page 5 outlines the procedure for quickly returning all the values in the selectable fields of the Setup Utility to the factory default values. Page 5 appears on the video monitor as shown in Figure 8.

```
          - SYSTEM CONFIGURATION -
ROM Date: 06/14/87            TMI/IPC Setup
Sunday,      January  1, 1987   14:09:36

            - Block Move Field -
Setting this field to "High Speed"
increases the speed of block move
transfers in and out of extended memory
by disabling the A20 gating logic.  This
could possibly cause incompatibility
problems with older software protection
mechanisms, especially electronic keys.
If you suspect a problem, change back
to "Compatible" and try again.
-------------------------------------------

            - Pages 3 and 4 -
Attempting to change values on these
pages may result in improper system
operation.  To restore the default
values, remove the battery jumper or
change the value for floppy disk A
on page 1 and press CTL-ALT-DEL.
-------------------------------------------

       Texas  MicroSystems,  Inc.
System Config Utility   Copyright, 1988
```

Figure 8 - Setup Utility Page 5

6.6 Setup Utility END Key Sequence

Touching the END key from any page of the Setup Utility will instruct the Setup Utility to record the configuration information complete with changes, recalculate the CMOS memory checksum and record these values in CMOS RAM, and restart the system from the power-up sequence. During the power-up sequence, BIOS will verify that the checksum values are correct and that the configuration information contained in the Setup Utility is consistent with the actual configuration. Therefore, it is suggested that the END key be touched after all desired and correct configuration selections have been made.

6.7 Setup Utility HOME key Sequence

Touching the HOME key from any page of the Setup Utility will instruct the Setup Utility to return control to the operating system without a system reset. The checksum values are recalculated and these new values along with the selection(s) changes are recorded to CMOS RAM, but the system is not truly aware of the configuration changes or new checksum values until a system restart has been made.

After the HOME key is pressed, control passes from the Setup Utility to the operating system and continues B386 operation, presumably from where the Setup Utility was originally invoked, without a system restart from the power-up sequence.

Touching the HOME key and continuing operation in this fashion is <u>not</u> generally recommended since unexpected results may occur. Using the HOME key to return from the Setup Utility could prove detrimental in instances where CMOS memory checksum values are checked within a continued application program. In such an instance, the application program would notice that the recorded data was not consistent with the data under which it was operating and a processing error or interruption of the program could occur. See the CAUTION notation in paragraph 6.0 of this manual for additional information on leaving the Setup Utility.

If no changes have been made to the configuration selections in the Setup Utility, a return of control to the operating system

APPLICATION NOTE
Rev F CPU Board

Texas Microsystems, Inc., has begin shipping a new revision of the AT compatible CPU board. The F revision provides several features not available on the E revision board.

1) The power monitor chip has been changed from a DS1231 to a DS1232 to take advantage of the DS1232 chip's power on reset switch capability and watchdog timer capability. User now has the option to reset the entire system, including system bus, or resetting only the CPU (as in earlier revisions). Jumper blocks E5, E6, and E7 were added to accomplish these functions, as follows:

   Reset Switch

CPU reset only	E5-1 to E5-2 Open	
BUS reset	E5-1 to E5-2 Installed	(DEFAULT)

   Watchdog Timer

Disabled	E7-1 to E7-2 Installed	(DEFAULT)
	E6-1 to E6-2 Open	(DEFAULT)
Enabled	E7-1 to E7-2 Open	
	E6-1 to E6-2 Installed	

2) Capacitor C24 has been changed to .0047 uf from 47 pf to provide a longer reset pulse to the clock when a battery is installed in a board.

3) A 47 uf tantalum capacitor has been added to the battery power line to reduce the possibility of transient during power-up or power-down. On the rev F CPU card, this capacitor is C22, replacing a bypass capacitor present on rev E.

4) The value of R4 has been changed to 39K from 51K, lowering the voltage level at which the clock switches over to battery power.

5) Polarity of reset switch was changed from normally closed to normally open. This was done to facilitate a remote reset switch connected to J8, and to provide the right polarity for the new DS1232. A change in the PPI chip (new revision 1.4) was made to accommodate the polarity change.

6) The clock circuit driving the optional coprocessor has been changed from a crystal to an oscillator, allowing 10 Mhz operation. Crystal Y5 and R10 were removed, while R9 was reassigned as a pull-up resistor. The new oscillator is OSC3, and is socketed.

7) A change was made to allow 27512 EPROMS to be used, providing for 128 KBytes of EPROM on the CPU board. To accomplish this change, XA15 is now routed directly to pin 27 of each EPROM socket, while XA16 is routed through SW1 pins 8 and 9, then on to pin 1 of each EPROM. This allows 27256 EPROMS to be used if switch 8 is open, and 27512's if switch 8 is closed. Note that 27128 EPROMS may no longer be used.

   Note also that the default position (27256 EPROMS) changes from switch 8 open to switch 8 closed.

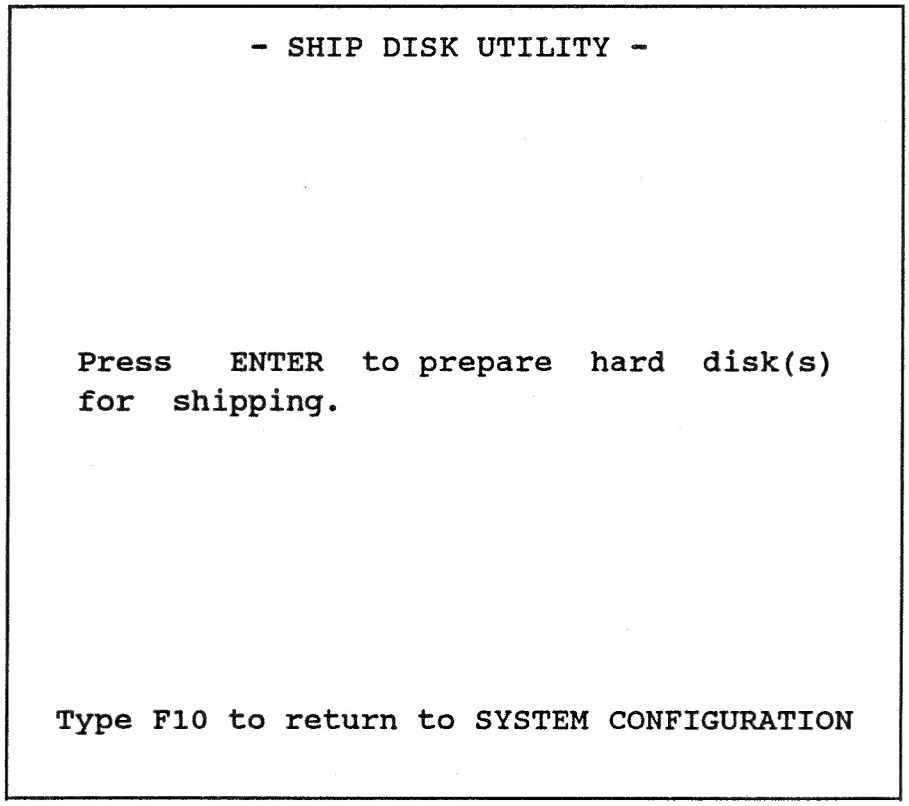


Figure 9 - Ship Disk Utility

As indicated by the example of the Ship Disk Utility (Figure 9), while this feature is accessed, touching the ENTER key on the keyboard will prepare the fixed disk(s) for transport. Pressing the F10 key on the keyboard while this feature is activated will not prepare the fixed disk(s), but instead will return control back to the Setup Utility page from which the F1 key was touched. If the ENTER key is pressed to prepare the disk(s) for shipment, the following message will be displayed on the video monitor:

> System is ready for shipping.
> Turn power off now.

Following the instructions of the displayed message, turn off power to the system. The fixed disk(s) are prepared for shipping and their read/write heads will remain parked until power is again applied to the system.